

## TITLE OF THE INVENTION

### DISK CARTRIDGE

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims the benefit of Korean Application No. 2001-56224, filed September 12, 2001, in the Korean Industrial Property Office, the disclosure of which is incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

**[0002]** The present invention relates to a disk cartridge containing a disk, which is an information recording/reproducing medium, and more particularly, to a disk cartridge capable of inhibiting an inflow of dust from the outside.

### 2. Description of the Related Art

**[0003]** FIG. 1 shows a conventional disk cartridge 10 which contains a disk D that will be used in a disk drive device 20. The disk cartridge 10 includes upper and lower cases 11 and 12 and a shutter 13. The upper and lower cases 11 and 12 form an inner space in which the disk D is contained. The shutter 13 selectively opens and closes an opening hole 12a formed at the lower case 12 so as to allow a pickup 21 of the disk drive device 20 to access the disk D. An opening lever 22 installed in the disk drive device 20 opens and closes the shutter 13. FIGS. 2A and 2B show that as the disk cartridge 10 enters the disk drive device 20, a peg on an end of the opening lever 22 contacts and pushes a protrusion 13a of the shutter 13 to open the shutter 13.

**[0004]** The disk D is contained in the disk cartridge 10 to be protected from foreign matter such as dust which can hinder the accurate processing of a signal during a recording or reproducing operation. However, the shutter 13 must be opened to allow the pickup 21 of the disk drive device 20 to access the disk D. Thus, dust flows into the disk cartridge 10 through the opening hole 12a. In other words, while the disk D is kept in the disk cartridge 10 to be protected from dust, dust flown into the disk cartridge 10 through the opening hole

12a cannot be prevented when the disk cartridge 10 is inserted into the disk drive device 20. Therefore, there is a need for a way to prevent dust from entering the disk cartridge 10 through the opening hole 12a during a recording and reproducing operation.

## **SUMMARY OF THE INVENTION**

**[0005]** Accordingly, it is an object of the present invention to provide an improved disk cartridge which can exclude the possibility of an inflow of dust from the outside when the disk cartridge is inserted into a disk drive device.

**[0006]** Additional objects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

**[0007]** To achieve the above and other objects of the present invention, there is provided a disk cartridge which includes a case for containing a disk and a transparent window installed to the case so as to allow an external light to access the disk in the case.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0008]** The above objects and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 is a drawing showing a conventional disk cartridge next to a disk drive device;

FIGS. 2A and 2B are drawings which illustrate a process of opening a shutter of the conventional disk cartridge shown in FIG. 1;

FIG. 3 is a perspective view of a disk cartridge having a case and a transparent window according to an embodiment the present invention;

FIG. 4 is a perspective view showing the case and the transparent window shown in FIG. 3, in a combined state;

FIG. 5 is a drawing showing a light access process through the transparent window of the disk cartridge shown in FIG. 4;

FIG. 6 is a perspective view of a disk cartridge according to another embodiment of the present invention; and

FIG. 7 is a perspective view of a disk cartridge according to yet another embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

[0009] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals to like elements throughout.

[0010] FIGS. 3 and 4 show a disk cartridge 100 which includes a case 120 and a transparent window 110. The case 120 forms a space for containing a disk D. The transparent window 110 is installed in an opening hole 101 of the case 120 so as to allow a light emitted from a recording/reproducing unit such as the pickup 21 shown in FIG. 1, to access the disk D. The transparent window 110 is formed of a transparent material such as acryl or a glass.

[0011] FIG. 5 shows that a transparent window 110 allows a light emitted from a pickup 21 to access a disk D without compromising the sealed state of a case 120. In a prior art, a shutter is opened and closed to open an opening hole through which a light accesses the disk D. In contrast, an embodiment of the present invention allows a light to directly access the disk D through the transparent window 110. Assuming that a distance  $t$  from a surface of the transparent window 110 to the disk D is 1mm, a numerical aperture  $NA$  of a lens of the pickup 21 is 0.6, and a refractive index  $n$  of the transparent window 110 is 1.5, the diameter  $d$  of the light to be focused on the disk D at the surface of the transparent window 110 is 0.8mm (obtained by  $(2 \times t \times NA)/n = (2 \times 1 \times 0.6)/1.5$ ). This means that there is no problem accessing the disk D using the light if a width  $W$  of the transparent window 110 is wider than 0.8mm. The width  $W$  of the transparent window 110 may vary depending on the material of the transparent window 110, the numerical aperture  $NA$ , or the distance  $t$ . However, for a disk cartridge according to an embodiment of the present invention, 2mm is a sufficient width for the width  $W$  of the transparent window 110. In other words, dimensions of a disk cartridge need not be altered by incorporating the transparent window 110.

**[0012]** According to an aspect of the present invention, the transparent window 110 is attachable to and detachable from the opening hole 101, as shown in FIG. 3. Thus, the transparent window 110 may be replaced with a new one if defects such as scratches occur on the transparent window 110.

**[0013]** FIGS. 3 and 4 show that it is not necessary for the disk cartridge 100 to have a shutter to open when entering the disk drive 20 shown in FIG. 1. Therefore, the opening lever 22 shown in FIG. 1 is also not needed. After the disk cartridge 100 enters the disk drive device 20 shown in FIG. 1, the pickup 21 radiates a light to the disk D through the transparent window 110. Next, a recording and/or reproducing operation proceeds with the light reflected from the disk D being received.

**[0014]** The light emitted from the pickup 21 accesses the disk D in the same way as in the conventional art. However, since the disk cartridge 100 has hardly any regions opened, the possibility of dust entering into the disk cartridge 100 is considerably reduced. This in turn results in a reduction in the possibility of errors occurring during signal processing. However, a light signal may be affected by dust on a surface of the transparent window 110, if the diameter of particles of dust is 30% of the diameter of a light incident on the transparent window 110. Thus, if the diameter of the light is 0.8mm as described above, particles of dust with a diameter of over 0.24mm can affect the light signal. However, particles of dust with such a diameter are readily observed by the naked eye and can be easily removed. Also, as described above, the transparent window 110 may be replaced with a new one if it gets scratched.

**[0015]** According to another embodiment of the present invention, the transparent window 110 is modified to protect the transparent window 110 from scratches. FIG. 6 shows that a transparent window 110a is manufactured and/or installed so that its surface is inwardly depressed relative to a surface of a case 120. The inwardly depressed transparent window 110a lowers the probability that objects will touch the transparent window 110a, and reduces the possibility of scratches to the transparent window 110a.

**[0016]** According to yet another embodiment of the present invention, the transparent window 110 may be protected from scratches by using a conventional shutter mechanism. FIG. 7 shows that a transparent window 110b (either inwardly depressed or at level with a

surface of a case 120) is covered by a shutter 130 that selectively opens and closes to reveal the transparent window 110b. The transparent window 110b seals a disk cartridge 100 having a disk D and prevents dust from entering the disk cartridge 100. The shutter 130 provides protection to the transparent window 110b from scratches.

[0017] A disk cartridge is provided with a transparent window through which a light accesses a disk. The transparent window prevents foreign matter such as dust from entering the disk cartridge.

[0018] Although a few preferred embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

100 110a 110b 120 130 D